

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Physical Processes in Comets

PERFORMING ORGANIZATION

Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

INVESTIGATOR'S NAME

Ray L. Newburn, Jr.

DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

a. Strategy: When this program began in 1975 only limited photometry had been carried out on comets at any wavelength and that done had been largely what could be accomplished in single observing runs on bright comets. Program goals were to observe many comets, including faint periodic comets, at a range of heliocentric distances in order to begin to understand the range of behavior among comets and in a given comet during its approach and departure from the Sun. Then a study of the continuum of scattered light from dust was added. something no one else was doing in visible light, in order to measure dust to gas ratios. More recently the value of joint team observations in visible and infrared light has been recognized and utilized as often as possible.

b. Progress: All 1978-82 data has been reanalyzed and 1983-86 data analyzed in the framework of the post-Halley paradigm, covering 25 comets in all. Four observing runs at the IRTF (June, July, Sept., and Jan.) with Hanner produced excellent results on Wilson, Bradfield, P/Klemola, and P/Borrelly and lesser data on other objects, including the last reported IR photometry of P/Halley. The Wilson and Halley data have been reduced and written up for publication, and those on Bradfield and Borrelly are currently in work and being combined with visible light observations from Lick Observatory.

c. Anticipated Accomplishments: Today a complete new approach is being planned, involving 2-dimensional observations in visible and infrared and more realistic non-isotropic, chemical modelling of gases and dust. Solutions will be sought in coming years to the problems of gas evolving from dust, dust fragmenting, non-isotropic emission of dust and gas, non-steady flow of dust and gas, and improved theoretical modelling of chemical processes leading to improved knowledge of composition. Observations will be 2-dimensional whenever possible (CCDs and infrared arrays), improved photometric accuracy sought, and improved chemical modelling utilized in cooperation with the JPL astrochemistry team.

d. Divine, N. and Newburn, R. L. Jr., "Modeling Halley Before and After the Encounters," *Astron. Astrophys.*, 187, 867, (1987).

Hanner, M. S., Newburn, R. L. Jr., et al, "Comet Sugano-Saigusa-Fujikawa (1983V), A Small Puzzling Comet," *Astron. J.*, 94, 1081, (1987).

Newburn, R. L. Jr. and Spinrad, H., "Spectrophotometry of Seventeen Comets. III. Post-Halley Updates Plus Eight Additional Comets., *Astron. J.* (in typing).